

Date of Report: 08/03/2019**BURNED-AREA REPORT****PART I - TYPE OF REQUEST****A. Type of Report**

- ☒ 1. Funding request for estimated emergency stabilization funds
☐ 2. No Treatment Recommendation

B. Type of Action

- ☐ 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
☒ 2. Interim Request # 1
☒ Updating the initial funding request based on more accurate site data or design analysis

PART II - BURNED-AREA DESCRIPTION**A. Fire Name: Museum Fire****B. Fire Number: AZ-COF-000788****C. State: AZ****D. County: Coconino****E. Region: 3 (Southwestern)****F. Forest: Coconino National Forest****G. District: Flagstaff RD (030408)****H. Fire Incident Job Code: P3MGKO****I. Date Fire Started: 7/21/2019****J. Date Fire Contained: Not contained (91%)****K. Suppression Cost: \$9,000,000****L. Fire Suppression Damages Repaired with Suppression Funds (estimates):** Click here to enter text.

- Fireline repaired (miles):** 9 miles of hand lines and dozer lines were repaired.
- Other (identify):** Roads within the burned area have been reshaped, and some cross-drain culverts were removed from road prisms in anticipation of flooding and debris flows that could overwhelm or obstruct culverts. Some chipping of small trees and woody debris has occurred and chipped material was used for erosion control in disturbed areas such as locations where vehicles were parked.

M. Watershed Numbers:*Table 1: Acres Burned by Watershed*

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
150200150104	Lower Rio de Flag	35,334	1501	4.25
150200150102	Upper Rio de Flag	44,582	351	0.79
150200150103	Doney Park	42,164	110	0.26

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	1,886.57
OTHER FEDERAL (LIST AGENCY AND ACRES)	
TRIBAL LAND	74.43
STATE	
PRIVATE	
TOTAL	1,961

- O. **Vegetation Types:** 1) Mixed Conifer (Douglas fir 877 ac., TES MU 613), 2) Mixed Conifer (white fir, Douglas fir), and Ponderosa Pine/Gambel oak (513 ac., TES MU 596), 3) Ponderosa Pine/Arizona fescue (87 ac. TES MU 551 & 553), 4) Alpine Meadow (Arizona fescue, nodding brome, mountain muhly) (41 ac. TES MU 640).
- P. **Dominant Soils:** Mollic Eutroboralfs, loamy-skeletal, mixed, deep, cobbly sandy loam, Typic Argiborolls loamy-skeletal, mixed, moderately deep, sandy loam, Rock Outcrop, Lithic Haploborolls, loamy-skeletal, mixed, shallow, very gravelly sandy loam, Eutric Glossoboralfs, loamy-skeletal, mixed, deep, very bouldery sandy loam, Eutric Glossoboralfs, loamy-skeletal, mixed, moderately deep, very bouldery sandy loam, Pachic Udic Argiborolls, loamy-skeletal, mixed, deep, gravelly loam, Eutric Glossoboralfs, loamy-skeletal, mixed, deep, very stony loam.
- Q. **Geologic Types:** Middle Pliocene to Holocene units consisting of andesite, dacite, trachyte, and rhyolite rock types (1708 ac.) and Paleozoic units consisting of sedimentary rocks of limestone, sandstone and mudstone (219 ac.), and Quaternary surficial deposits.

R. **Miles of Stream Channels by Order or Class:**

Table 3: Miles of Stream Channels by Order or Class

STREAM ORDER	MILES OF STREAM
FIRST	6.07
SECOND	0.99
THIRD	0.14

There are no perennial streams within the burned area. Schultz Creek is an intermittent drainage below the burned area, but is ephemeral within the burned area.

S. **Transportation System:**

Trails: National Forest (miles): 8.76 miles Other (miles):

Roads: National Forest (miles): 5.88 miles Other (miles):

PART III - WATERSHED CONDITION

A. **Burn Severity (acres): 7.36 Acres of No Data Exist (Cloud Cover)**

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Other Federal (List Agency)	State	Private	Total	% within the Fire Perimeter
Unburned/Very Low	222.06			14.16		12
Low	894.85			44.82		48
Moderate	534.88			10.98		28
High	227.42			4.37		12
Total	1,879.21			74.33		100

- B. Water-Repellent Soil (acres):** All moderate and high soil burn severity (762 acres on NFS lands)
- C. Soil Erosion Hazard Rating:** Slight (90.1 ac.), Moderate (582.9 ac.), Severe (1288.5 ac.)
- D. Erosion Potential:** Throughout the entire burned area, including low, moderate, and high soil burn severities the soil erosion potential is estimated to be 11.8 tons per acre per year. Erosion potential in moderate and high soil burn severities only is estimated to be 17.6 tons per acre per year. This value for areas of moderate and high soil burn severity is 4 to 7 times soil tolerance threshold. **Sediment Potential:** The entire burned area has potential to deliver 5,970 yds.³ per sq. mi.
- F. Estimated Vegetative Recovery Period (years):** 5 years. May be longer in areas of high soil burn severity.
- G. Estimated Hydrologic Response (brief description):**
 Post-fire hydrologic response from a one inch, one hour duration rain event (roughly equating to a 2 year return interval) uniformly distributed using a SCS type 2 storm distribution over the entire catchment in which the fire largely occurred, known as the Spruce Avenue Wash watershed, was modeled using WILDCAT5 and KINEROS2 as parameterized through AGWA (AGWA-K2). Expected post fire peak flows are 100 times pre-fire flows. The drainage for this catchment enters a highly urbanized portion of the City of Flagstaff. Existing drainage infrastructure is purported to be inadequate to convey this peak discharge through the City of Flagstaff. Given the distribution of high and moderate soil burn severities, steep slopes of the catchment, high percentage of the catchment impacted by fire (37% as delineated where Spruce Avenue Wash crosses Linda Vista Avenue), and the intense nature of rain events associated with the North American monsoon, widespread channel incision is very likely with headward extension of drainages into zero order hillslopes. Areas that currently store sediment such as broad alluvial portions of Spruce Avenue wash at the base of Mount Elden will likely transition to sediment sources.
- Debris flows are very likely to occur, 557 is especially threatened by post-fire debris flows and the associated scouring and erosion. The stretch of FSR 557 with the highest risks is along the steep slopes of Eldon Mountain. Along this section, the road crosses six critical drainages which are at risk of debris flows. Debris flows scour material from the channel and may result in the loss of the roadbed, similar to the Waterline Road after the Schultz Fire. Runoff from rills and gullies that form on the slopes above the road will likely require repeated maintenance. The section of FSR 557 that is located adjacent to the channel on the south is at risks from debris flows from slopes on the north, and from flows that exit the channel. Both debris deposition and scouring may occur on this section of road.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Museum Fire was discovered on July 21st at 11:15 a.m. north of Flagstaff, Arizona (35° 15' 27.7", 111° 38' 34.8") on the Flagstaff Ranger District of the Coconino National Forest. The fire originated in ponderosa pine with heavy dead and down and mixed conifer in the higher elevations. The cause of the fire remains unknown and is under investigation. As of the writing of this report, the fire is 91 percent contained at 1,961 acres.

A. Describe Critical Values/Resources and Threats (narrative):

Critical Values identified during the BAER assessment that have potential to be Values at Risk as defined in FSM 2523.1 include: human life and safety, natural resources (soil and water, Threatened and Endangered species habitat, and native plant communities), and forest service property (road and trail infrastructure). The BAER team evaluated the risk to these critical values in accordance with Interim Directive No. 2520-2018-1 by using the BAER Risk Assessment.

Table 5 below displays the BAER Risk Assessment, which provides the rationale for determining the likelihood of damage or loss of Values at Risk and assigning the corresponding magnitude of consequences of such

damage or loss during the risk assessment process, thereby identifying the level of risk resulting from post-wildfire effects.

Table 5: BAER Risk Assessment

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

The following Critical Values were identified on NFS lands during the Museum Fire BAER Assessment:

1. **Human Life and Safety (HLS):** There is very high risk to human safety and loss of life on NFS lands within and downstream of the burned area. Threats to human life and safety within the burned area include falling trees and limbs (danger trees), rolling rocks, flash floods and debris flows. Threats downstream of the burned area on NFS lands include flash floods and debris flows, particularly in drainages that lack adequate capacity to accommodate flood flows. Access to critical infrastructure including a fire lookout, forest communications site, and emergency services communications is key to protecting human life and safety across the eastern portion of the Coconino National Forest and parts of the Kaibab National Forest.
2. **Property (P):**
 - a. There is a very high risk to Forest Service road infrastructure within the burned area. FSR 557 is the only access to the Mt. Elden Fire Lookout, fire detection equipment and critical FS communication infrastructure (repeater) at the top of the Mountain. This road is typically open to the public. The road is a cut and fill road that traverses steep terrain along the southern side slopes of Elden Mountain. The road not only has high diversion potential, but also has potential to deliver large amounts of sediment and debris to downslope and downstream areas, resulting in bulking of runoff and increased potential to initiate rills, gullies and channel incision. This road is also the only access for communication towers, infrastructure, and equipment for approximately 33 companies including, but not limited to APS, WAPA, AZ DPS, AT&T, Verizon Wireless, T-Mobile, Kinder Morgan and various other communications and utility companies. (Non-FS).
 - b. FSR 789 is at a high risk of damage from accelerated erosion. These roads have served as haul roads for tree harvesting and fuel reduction activities for the Flagstaff Water Protection Project.
 - c. The Museum Fire burned 8.75 miles of Forest System Trails across the slopes of Elden Mountain and Dry Lake Hills. Approximately 22.4% or 2 miles of trail burned in Moderate or High Soil Burn Severity (SBS) and all of this was through steep terrain above 15% slopes. All models showed an unacceptable threshold for soil erosion in these areas. Trail infrastructure such as trail treads are expected to be damaged or lost after storm events with increased flows, erosion, and debris flows. Trails will transport surface flows where they capture and divert runoff, resulting in loss of trail treads and potentially eroding trail surfaces into areas that burned at low soil burn severity or remain unburned.
3. **Natural Resources (NR):**
 - a. There is a very high risk to loss of soil productivity and hydrologic function as a result of high and moderate burn severities within the burn area. Areas that burned at moderate and high soil burn severity will very likely exhibit accelerated soil erosion and sediment delivery to stream courses, particularly on steep terrain, on convex slopes leading to drainages, and in steep, confined, upper drainage channels. Vegetative cover is critical to minimizing soil erosion rates, maintaining hydrologic

function and sustaining site productivity. Natural re-establishment of cover is typically the preferred BAER recommendation. However, fire-induced water repellent conditions will negatively impact soil stability and hydrologic processes. In areas of low soil burn severity, fire effects to soils are likely to dissipate within 1 to 3 years. It could take as long as 25 years for soils that exhibit moderate soil burn severity to stabilize and return to full productive status, and it could take several hundred years for areas of high soil burn severity to return to full productivity and stability. Loss of soil stability and productivity would be exacerbated if wide-spread, high intensity precipitation or rapid snowmelt (e.g., rain on snow) occurs within the recovery period. Soil erosion and sediment delivery above pre-fire rates will occur. Accelerated soil erosion delays vegetative recovery and re-establishment of native plant communities if rates exceed soil-loss tolerance thresholds.

- b. There is a very high risk to Mexican Spotted Owl (*Strix occidentalis lucida*) Occupied Protected and Recovery Habitat and Critical Habitat. Accelerated soil erosion has potential to delay recovery of natural vegetative communities, resulting in loss of MSO Critical Habitat Primary Constituent Elements.
- c. An emergency condition exists in areas where the potential for invasive or noxious plant species introduction is very high risk. Native vegetation communities and MSO critical habitat are at a very high risk from invasion of invasive species. Soil productivity, hydrologic function, and ecosystem integrity are other values at risk from invasive or noxious plant species. Invasive or noxious plants may result in a decrease or loss of natural recovery because of their ability to out-compete native vegetation for solar energy, soil nutrients, and water. These species also affect vital soil functions; nutrient cycling, ability to resist erosion, and hydrologic function. These soil functions relate directly to soil condition.

Invasive or noxious weed species are a major concern following wildfire. Removal of the existing vegetation by fire, and disturbances from suppression efforts such as dozer and hand lines, staging areas, drop points and helispots are disturbed areas where invasive or noxious weeds may become established and inhibit recovery of desirable vegetation. Dalmatian toadflax (*Linaria dalmatica*), is a non-native invasive plant that is difficult to control. This plant was observed within the fire area during surveys conducted prior to the fire. These infestations are mainly along roads and trails and exist in trace amounts within the fire perimeter. Dalmatian toadflax is a perennial species that reproduces by seeds and by creeping rhizomes, making it difficult to control. It responds well to wildfire and can persist at the expense of the native plant communities. The Arizona Wildland Invasive Plant Working Group (AWIPWG) has listed the Dalmatian toadflax as a prohibited restricted medium species.

Other invasive or noxious species such as diffuse knapweed (*Centaurea diffusa*) and Scotch thistle (*Onopordum acanthium*) may have been introduced during fire suppression. These species are known to exist along the roadways that serve as access to the burned area and could have inadvertently been introduced into the burned area by fire suppression vehicles and equipment. The AWIPWG has listed diffuse knapweed as a prohibited restricted medium species and Scotch thistle as a prohibited restricted low species.

- 4. **Cultural and Heritage Resources:** A total of six archaeological sites were assessed post-fire to determine fire effects and potential post-fire treatment needs. Of the six sites, only one was located within the fire perimeter (AR-03-02-1167). Site AR-03-02-1167 is a historic temporary habitation site with multiple features. This site is considered Not Eligible to the National Register of Historic Places. Risks to cultural and heritage resources are therefore possible and the magnitude of consequences is minor, resulting in a low risk to these resources.

Table 6. Risk Table for BAER Critical Values that have been identified as Values at Risk with High or Very High ratings for Magnitude of Consequences and where treatments are recommended.

Risk Type	Critical Value	Threat(s)	Probability of Damage	Magnitude of Consequence	Risk	Forest Service Treatment Method
Life/Safety	Human life and safety	Falling trees and limbs (hazard trees), rolling rocks, flash floods and debris flows, burned out stump holes	Very Likely	Major	Very High	Recommend Area Closure during high risk season (monsoon) and re-evaluate. Hazard Notification and Warning due to WUI area with numerous user trails and access points that would be hard to enforce.
Natural Resources	Mexican Spotted Owl (MSO) habitat	Loss of habitat erosion that would affect native plant community recovery	Very Likely in high burn severity and Likely in moderate burn severity	Major	Very High in both moderate and high burn severity	Mulching would help maintain primary constituent elements
Natural Resources	Soil Productivity, Hydrologic Function, and Native Plant Communities	Invasive plants	Very Likely	Moderate	Very High	Noxious weed detection/rapid response.
Natural Resources	Soil Productivity/ Hydrologic Function	Post-fire erosion	Very Likely	Major	Very High (High and Moderate SBS)	Mulch with wood shred using pre-existing log decks and slash. 15 -65% slopes (507 Acres) in M & H SBS. Estimated 6 Tons/Acre for 1/4 to 1/2 inch depth coverage.
Property	FSR 557, Human life and safety	Loss of road prism through diversion potential (runon and stormflow down road surface)	Very Likely	Major	Very High	Construction of additional road drainage structures, reinforcement of existing drainage structures, roadbed hardening, sediment basins, flow energy dissipation structures, debris mitigation structures, drainage structure

Risk Type	Critical Value	Threat(s)	Probability of Damage	Magnitude of Consequence	Risk	Forest Service Treatment Method
						removal (culverts), opening up the roadbed where it crosses drainages to allow unimpeded flow and removing post flood/debris flow events
Property	FSR 789, Human life and safety	Damage to road prism through diversion potential (runon and stormflow down road surface)	Likely	Moderate	High	Install minor road drainage and stabilize diversions to prevent runon, erosion and provide scour protection
Property	Trail (Brookbank),	Debris flows and flooding below channels and moderate and high SBS.	Very Likely	Moderate	Very High	0.7 miles of trail stabilization and storm proofing, including installation and reinforcement of drainage structures (drain construction, rolling dips, outsloping, and retaining walls) focused on the knob of high and moderate severity above the Brookbank Meadow. Removal / mitigation of fire weakened hazard trees, as need for worker safety (not widespread).
Property	Trail (Lower Oldham)	Debris flows and flooding below channels and moderate and high SBS.	Very Likely	Moderate	Very High	0.27 miles of Trail Stabilization and storm proofing, including installation and reinforcement of drainage structures (drain construction, rolling dips, outsloping, and retaining walls) where the trail enters/leaves

Risk Type	Critical Value	Threat(s)	Probability of Damage	Magnitude of Consequence	Risk	Forest Service Treatment Method
						Spruce Ave. Wash.
Property	Trail (Sunset Trail)	0.45 miles of Sunset Trail traverses through slopes over 15% across areas of Moderately and High SBS. Increased Erosion and Run Off below these slopes and onto the trail	Very Likely	Moderate	Very High	0.36 miles of Trail Stabilization and storm proofing, including installation and reinforcement of drainage structures (drain construction, rolling dips, outsloping, and retaining walls) focused on the segment of trail between the 'Catwalk' near Heart Trail junction and the 'Hobbit Forest' near the Little Bear Trail Junction. Removal / mitigation of fire weakened hazard trees, as need for worker safety (not widespread).
Property	Trail (Rocky Ridge)	Debris flows and flooding	Very Likely	Moderate	Very High	0.43 miles of Trail Stabilization and storm proofing, including installation and reinforcement of drainage structures (drain construction, rolling dips, outsloping, and retaining walls) focused on the segment of trail between the Arizona National Scenic Trail junction and FR 557

Risk Type	Critical Value	Threat(s)	Probability of Damage	Magnitude of Consequence	Risk	Forest Service Treatment Method
						across the 'Ginger' drainage. Removal / mitigation of fire weakened hazard trees, as need for worker safety (not widespread).

B. Emergency Treatment Objectives:

Life and Safety

1. Post closure and warning signs to control public access and to inform the public of post-wildfire hazards that exist within the burned area.

Land Treatments

2. Mulch to minimize the negative effects to soil productivity and hydrologic function from runoff and sedimentation. This treatment will also assist in stabilizing key areas above FSR 557, MSO habitat, and provide ground cover to assist in protection of native plant communities from invasion by invasive species.
3. Early detection and rapid response to targeted areas to detect infestation of invasive and noxious weeds in burned areas as well as locations impacted by suppression activities to determine the extent of necessary control treatments.

Road and Trail Treatments

4. Ensuring access to the fire lookout, forest service communications, and emergency services communication. This critical infrastructure is in important for communication across the eastern portion of the Coconino National Forest and detecting and reporting new fire starts across the Coconino and Kaibab National Forests. FSR 789 will need drainage reinforcement and berm removal to protect the critical value.
5. Minimal work should be done to save some trail segments from total loss requiring full reconstruction.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:

Land 70

Channel NA

Roads/Trails 70

Protection/Safety 80

D. Probability of Treatment Success

Table 7: Probability of Treatment Success

	1 year after treatment	3 years after treatment	5 years after treatment
Land	70%	80%	90%
Channel			
Roads/Trails	70%	80%	90%
Protection/Safety	80%	85%	95%

E. Cost of No-Action (Including Loss): \$5,659,309.00

F. Cost of Selected Alternative (Including Loss): \$3,738,453.00 Skills Represented on Burned-Area**Survey Team:**

- ☒ Soils ☒ Hydrology ☒ Engineering ☒ GIS ☒ Archaeology
☒ Weeds ☒ Recreation ☒ Fisheries ☒ Wildlife
☒ Other:
 Geology

Team Leader:

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Team Members: *Table 8: BAER Team Members by Skill*

Skill	Team Member Name
<i>Team Lead(s)</i>	Micah Kiesow, Christopher MacDonald
<i>Soils</i>	Rory Steinke (AD), Thomas Giambra, Dan Neary (RMRS)
<i>Hydrology</i>	Thomas Runyon, Edwin Bone, Allen Hayden (Natural Channel Design), Joe Loverich (JE Fuller)
<i>Engineering</i>	Sean Untalan
<i>GIS</i>	Ralph Falsetto, Alex Heeren
<i>Archaeology</i>	Dagmar Galvan, Emily Engen
<i>Weeds</i>	Debra Crisp
<i>Recreation</i>	Patrick McGervey, Paul Dawson
<i>Geology</i>	Ann Youberg (AZ Geological Survey)

H. Treatment Narrative: Land Treatments:**Mulching**

Aerial mulching using wood shreds is recommended on 507 acres that burned at high and moderate soil burn severity. Mulch is the most effective treatment for controlling erosion and reducing runoff as it provides immediate ground cover (Robichaud, et al, 2010, Napper, 2006, Larsen, et al, 2009). Areas proposed for mulching would be treated at the rate of approximately 6 tons/acre to provide a .25 - .5 inch (approximately one layer of interlocking shreds) soil cover on approximately 60-80% of the ground surface. Wood shreds should be a mixture of longer (4-10-inch pieces and shorter length pieces 2-6 inches to provide interlocking layers on the soil. Mulch would be applied by helicopters at locations identified on treatment maps. Wood mulch will reduce rainsplash, soil particle detachment and entrainment in accelerated runoff. This will reduce soil loss and bulking of runoff, thereby reducing potential for stream channel scour and incision. It would be effective for reducing soil loss and loss of soil productivity and hydrologic function and would also provide some reduction in peak flows that threaten downstream life and safety and FS infrastructure. Retaining soil on site will reduce the risk of loss of MSO Critical and Recovery Habitat and provide foraging and nest/roost opportunities in the future. It will increase surface roughness and provide substrates that contribute to restoration of nutrient cycles. There is sufficient woody biomass of both harvested logs and residual woody debris (slash) within or adjacent to burned areas that can be used for mulch. These materials will need to be shredded or ground to specifications suitable for aerial application. This treatment will also reduce runoff velocities and volumes to road surfaces, thereby reducing erosion of road surfaces. This treatment will increase ground cover reducing the risk of invasion by invasive species. An additional advantage to using wood mulch is its

weight. Wood mulch has greater weight than agricultural straw, thereby preventing it from being mobilized in runoff.

Channel Treatments: None

Roads and Trail Treatments:

Emergency stabilization treatments should be implemented as quickly as possible to protect human life and safety and minimize negative impacts to other Critical Values. Storm patrol, road hardening, scour protection, drainage reinforcement, debris mitigation structures and energy dissipation structures should be installed and reinforced immediately to protect the critical value of FSR 557. FSR 789 will need drainage reinforcement and berm removal to protect the critical value.

The hydrologic and debris flow analyses in this area have determined that a 2 year storm event has the potential to cause severe damage to the roadway. This storm has a 50% chance of recurrence with every storm event for the duration of the monsoon season and due to the location of Elden Mountain there is a high likelihood of this storm event occurring in the Museum burn scar more than once in the upcoming monsoon season.

Road hardening structures will be installed where six critical drainages cross the road and will provide protection against high runoff and debris flow coming from the upper reaches of the drainages. These structures will consist of prefabricated concrete revetment mats installed by contract. These hardened sections will be accompanied by scour protection on the downhill side of the roadway and debris mitigation structures above the road within the drainage. Other road drainage features will be reinforced with additional compacted road embankment material and rip rap rock.

FSR 557 Emergency Flood Equipment						
ROADS-FA	Description	Method of Measure	Estimated Quantity	Pay Unit	Estimated Unit Cost	Total
Pay Item						
	Dozer D8	Month	4	Month	\$17,500.00	\$70,000.00
	Excavator with thumb attachment	Month	4	Month	\$6,500.00	\$26,000.00
	Wage Grade employee	Day	20	Day	\$550.00	\$11,000.00
	Subtotal Roads					\$107,000.00
FSR 557 BAER Road Protection - Contract						
ROADS-Contract						
Pay Item	Description	Method of Measure	Estimated Quantity	Pay Unit	Estimated Unit Cost	Total
	Mobilization	LSQ	1	LS	\$118,180.00	\$118,180.00
	Design	LSQ	1	LS	\$80,000.00	\$80,000.00
	Road Hardening - concrete revetment mat w/ slope protection	CY	1800	CY	\$550.00	\$990,000.00
	Embankment Testing	EA	6	EA	\$2,800.00	\$16,800.00
	Energy Dissipation	EA	6	EA	\$15,000.00	\$90,000.00
	Sediment basin with	EA	1	EA	\$5,000.00	\$5,000.00

	slope hardening					
	Subtotal Roads					\$1,299,980.00
FSR 557 BAER Road Protection – Force Account						
ROADS-FA						
Pay Item	Description	Method of Measure	Estimated Quantity	Pay Unit	Estimated	Total
	Rolling Dip Reinforcement	EA	57	EA	\$1,100.00	\$62,700.00
	Energy Dissipation - riprap	EA	3	EA	\$7,200.00	\$21,600.00
	Energy Dissipation - log drop structure	EA	2	EA	\$2,450.00	\$4,900.00
	Energy Dissipation - log debris control	EA	8	EA	\$2,500.00	\$20,000.00
	Sediment basin with slope hardening	EA	1	EA	\$5,000.00	\$5,000.00
	Subtotal Roads					\$114,200.00
FSR 789 BAER Road Protection - Force Account						
ROADS-FA						
Pay Item	Description	Method of Measure	Estimated Quantity	Pay Unit	Estimated Unit Cost	Total
	Rolling Dip Reinforcement	EA	14	EA	\$1,100.00	\$15,400.00
	Berm removal	LS	1	LS	\$800.00	\$800.00
	Subtotal Roads					\$16,200.00
				Road Protection Costs	Total	\$1,537,380.00

Minimal work could be done to save some trail segments from total loss requiring full reconstruction. The only segments of trails recommended for treatment are segments that are at a very high risk and have a high probability of success for storm proofing and affective trail tread stabilization. Approximately 8.75 miles of trail occur within the burned area. Approximately 2 miles of trail are at a very high risk of loss.

Prescribed work would include trail stabilization and storm proofing, including installation and stabilization of drainage structures (drain construction, rolling dips, outsloping, and retaining walls) focused on trail segments in High and Moderate SBS. Removal / mitigation of fire weakened hazard trees would be required, as needed for worker safety, but would not be widespread.

Trail Stabilization						
<u>Units</u>			<u>Unit Costs/Mile</u>	<u>Units</u>	<u>Days</u>	<u>Cost</u>
Recreation Staff Contract Oversight			\$340.00	1	.25	\$85.00
Recreation Planner			\$300.00	1	.25	\$75.00
Trails Coordinator			\$210.00	1	4	\$840.00
Trail Contract or Partner Crew (8 members)			\$6,500.00	1	1	\$6,500
						X 2 Miles
Total	1.76 miles total (rounded to 2 miles to match Part VI)					\$15,000

Storm inspection and response would include a 2 person crew that would patrol the burned area after monsoon precipitation events to review storm effects and to insure that treatments remain effective at mitigating post-wildfire risks. Inspections shall include verifying the closure gates remain effective at preventing public access to the burned area, hazard signs remain in place and road and trails treatments remain effective at mitigating post-wildfire watershed response.

Estimated Storm Inspection and Response

Item	Cost
Personnel time:	
700.00/day for 15 days	\$ 10,500.00
Vehicle	\$ 1,400.00
Total estimated cost	\$ 11,900.00

This cost was approved in the initial 2500-8 funding request.

Protection/Safety Treatments:

An administrative closure is recommended to protect human life and safety. The closure should include the entire burned area and all drainages (stream channels) below the burned area on NFS lands. This closure would provide public protection from post-wildfire hazards such as falling trees, limbs and rocks, landslides, flooding and debris flows. At a minimum, this administrative closure should extend through the 2019 monsoon season, after which an evaluation should be made whether to extend or lift the closure order. Gates should be locked and hazard warning signs are recommended at primary access points to the burned area, including major roads (10) and trailheads (50) to control public access and to inform the public of post-wildfire hazards that exist within the burned area.

Item	Cost
Trail signs and posts (50)	\$ 2,750.00
Road signs and posts (10)	\$ 1,100.00
Personnel Cost (Two multi-resource personnel at \$350 per day each for 4 days)	\$ 2,800.00
Vehicle	\$ 384.00
Total estimated cost	\$ 7,034.00

This cost was approved in the initial 2500-8 funding request.

Item	Cost
Personnel Cost (Two multi-resource personnel at \$350 per day each for 12 days)	\$ 4,200.00
Total estimated cost	\$ 4,200.00

Early Detection and Rapid Response:

The task involves site visits to targeted areas to detect infestation of invasive and noxious weeds in burned areas as well as locations impacted by suppression activities to determine the extent of necessary control treatments. The task will be completed by agency personnel or through contract. Detection survey is expected to allow for protection of ecological integrity of native and sensitive plant communities. Surveys and rapid response eradication treatments will begin in 2020 during the flowering periods of weed species. Survey for annual and perennial noxious/invasive species that establish with summer rains should be accomplished during mid-late summer and early fall of 2020. For species that establish with winter rains, survey should occur during the late spring and early summer of 2019. A biological control method will be used to treat for Dalmatian toadflax (*Linaria dalmatica*) infestations which is outlined and approved in the FEIS for Integrated Treatment of Noxious or Invasive Weeds for Coconino, Kaibab, and Prescott National Forests. This treatment method is appropriate due to the amount and size of the burned area and a very high risk potential for the spread of this noxious weed species.

Item	Admin	Units	Cost	Total
Biocontrol site selection (detection) and release (response)	GS-07 Botanist	2 days	\$ 185.00/day	\$ 370.00
<i>Linaria dalmatica</i> biocontrol		40 boxes	\$ 100.00/box	\$ 4,000.00
Vehicle		6 days	\$ 7.00/day	\$ 42.00
Survey area (detection)	GS-07 GS-05 x 4	6 days	\$ 935.00/day	\$ 5,610.00
Total estimated cost				\$ 10,022.00

If chemical treatments (herbicide application) are necessary, backpack sprayers may be used in areas of steep terrain or sensitive soils. Treatments will be completed by agency personnel or through contract.

I. Monitoring Narrative:

Effectiveness monitoring is recommended to determine if the mulch treatments are effective. Monitoring will involve up to 3 site visits by Forest personnel or contractors. During each trip personnel will visit the targeted areas to determine if there is adequate mulch cover to prevent soil erosion, natural recovery and occurrence of invasive and noxious weed species. Photo documentation will occur. Transect data may be collected if warranted. Initial visits will occur within six weeks of mulching to observe cover effectiveness and natural response. Follow-up visits will occur toward the end of the 2019 growing season.

Visits will also occur during spring 2020 to observe mulch cover, natural recovery and germination of invasive and noxious weed species. A request for this funding is anticipated.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDING

Line Items	Units	Unit Cost	NFS Lands		Other \$	Other Lands		Non Fed \$	Total \$
			# of Units	BAER \$		# of units	Fed \$		
A. Land Treatments									
Mulching	acre	2,100	507	\$1,064,700	\$0		\$0	\$0	\$1,064,700
EDRR	day	1,253	8	\$10,024					
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
<i>Subtotal Land Treatments</i>				\$1,074,724	\$0		\$0	\$0	\$1,064,700
B. Channel Treatments									
				\$0	\$0		\$0	\$0	\$0
				\$0	\$0		\$0	\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
<i>Subtotal Channel Treatments</i>				\$0	\$0		\$0	\$0	\$0
C. Road and Trails									
Road Hardening Measures	mi	363,200	4	\$1,525,440	\$0		\$0	\$0	\$1,525,440
Trail Hardening Measures	mi	7,500	2	\$15,000	\$0		\$0	\$0	\$15,000
Storm Inspection and Resp	ev	793	15	\$11,895					
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
<i>Subtotal Road and Trails</i>				\$1,552,335	\$0		\$0	\$0	\$1,540,440
D. Protection/Safety									
Road Signs	ea	80	10	\$800	\$0		\$0	\$0	\$800
Road Sign Posts	ea	30	10	\$300	\$0		\$0	\$0	\$300
Trail Signs	ea	40	50	\$2,000					
Trail Sign Posts	ea	15	50	\$750					
Mileage	mi	800	0.48	\$384					
Personnel Cost	day	700	8	\$2,800					
Personnel Cost	day	350	12	\$4,200					
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
<i>Subtotal Protection/Safety</i>				\$11,234	\$0		\$0	\$0	\$1,100
E. BAER Evaluation									
Initial Assessment	Report	\$70,000		---	\$0		\$0	\$0	\$0
				\$0	\$0		\$0	\$0	\$0
<i>Insert new items above this line!</i>				---	\$0		\$0	\$0	\$0
<i>Subtotal Evaluation</i>				\$0	\$0		\$0	\$0	\$0
F. Monitoring									
Treatment Effectiveness Mo	yr	\$3	3500	\$10,500	\$0		\$0	\$0	\$10,500
				\$0	\$0		\$0	\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
<i>Subtotal Monitoring</i>				\$10,500	\$0		\$0	\$0	\$10,500
G. Totals				\$2,648,793	\$0		\$0	\$0	\$2,616,740
Previously approved				\$18,929					
Total for this request				\$2,629,864					

PART VII - APPROVALS

1. Laurel West 8/3/19
Forest Supervisor Date